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10th International Conference on Transport Survey Methods

Embracing technological and behavioral changes: a synthesis

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Abstract

This document presents an introduction to the ISCTSC Special Issue of Transport Research Procedia. It synthesizes the discussions held at the 10th International Conference on Transport Survey Methods, and describes the contents of the selected contributions. This conference has been held in different countries from all over the world, involving an increasing group of enthusiastic and generous specialists, willing to share their knowledge. This 10th conference was an opportunity to discuss the state of the art on transport survey methods, but also to question the way transport surveys are conducted. We took the opportunity to identify the main challenges, and the most important questions.

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Keywords: survey methods; technology; behaviour

1. Introduction

The 10th International Conference on Transport Survey Methods was held in Leura, Australia, in November 2014. This conference, titled "Embracing technological and behavioural changes", benefited from the contributions of a variety of researchers and professionals from across the world. This procedia gathers the main outcomes of the conference, using workshop reports along with some of the contributed papers presented during the 5 days of the conference. It provides an interesting synthesis of the most critical topics that were discussed during the conference.

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In this document, we first propose a description of the conference: how it was conducted, the a priori objectives, and the structuring of the workshops to enhance discussion. We then synthesise the main outcomes of the workshops, which are expanded on through each workshop report in the procedia. We also propose key elements from the plenaries as well as general research challenges for the transport survey communities. Finally, the structure of the procedia is described.

2. The 10th International Conference on Transport Survey Method

This conference series has a long history (Amp, 2014), that goes back to 1979, when the first International Conference on Transport Survey Methods was organized by Werner Brög in Grainau, Germany. Since then, ten conferences have been organized in eight different countries representing four of the five continents, involving an increasing group of enthusiastic and generous specialists who have contributed to the organization, discussion and dissemination of the conference and its results. The International Conference on Transport Survey Methods is now recognized as a unique conference where survey experts, transport researchers, and practitioners gather together to improve the conduct of surveys that support transport planning, policy, modeling, monitoring, and related issues for urban, regional, intercity, and international person, vehicle, and commodity movements. The legacy of the conference series is synthesized in eight publications that are a key reference for anyone conducting transport surveys (Ampt et al., 1985; Ampt et al., 1992; Bonsall and Ampt, 1996; Jones and Stopher, 2000; Stopher and Jones, 2003; Stopher and Stetcher, 2006; Bonnel et al., 2009; Zmud et al., 2013). This Procedia will complete the list, presenting the main contributions, discussions and conclusions of the tenth conference. This publication can be freely accessed by any interested reader increasing the impact of the conference worldwide.

The International Steering Committee for Travel Survey Conferences (ISCTSC) organizes these conferences with the aim of offering transport professionals (researchers, practitioners, modellers, planners, and others) the possibility to present their work, exchange information, network, promote international collaboration, and serve as a forum for the presentation of workshops, papers, and posters. Rapidly evolving problems and policy contexts are compelling us to advance the state-of-the-art of survey methods, tools, strategies and protocols, while assuring the stability and coherence of the data from which trends can be tracked and understood.

The previous conference (Zmud et al., 2013), held in 2011 in Chile, advanced in several topics, but also identified some challenges and open questions. For example, a conclusion of the 2011 conference was that newer survey methods are required to reduce the total design error, which comprises coverage error, sampling error, non-response error and measurement error. Also, a need to engage in behavioural research was identified. More work is required to define what is needed to measure social context and how to go about it. The role of visualisation and technology at all steps of the data collection process is an aspect to be studied. What is the required sample size for each type of survey (panel, before-after, cross-section, etc.) is an open question. We need comparative studies of survey methods, and validation of the outputs of methods relying on passive data streams using exogenous datasets. Continuous contextual and reference data to make today's data usable in the future is required (networks, land-use, weather, etc.). In the context of a new generation of integrated regional models, an open question is: What is the feasible best data collection strategy to both specify and run those models?

Within this context, the 10th conference aimed to address two central elements through the call for papers: New technologies: how they challenge traditional survey methods, their potential contributions to transportation planning and policy decision-making and the way they impact upon travel decisions. Decision and behavioural processes: use of qualitative and quantitative datasets to understand behavioural changes with regard to new issues and contexts (climate change, ageing population, social wellbeing, socio-technical transitions).

2.1. Specificity of the conference

This conference series has consolidated its international character, with a spatial coverage that varies depending on the location. The Leura conference had a majority of participants from the Asia-Pacific region, but included a large contingent from Europe, a significant number of participants from America (including North, Central and South America) and a small number from Africa. Previous conferences have also shown this proximity bias. It is

important that the conference venue is defined in different countries and different regions of the world, to keep this balance.

As stated earlier, the conference themes are defined over the basis of previous conferences, which are used to draw a research map, and focus the call for papers. The workshop themes are defined according to the response to the call for papers. This definition is very important, because the conference is mainly based on workshops. In this case, the call attracted more than 140 abstracts, which translated into 113 accepted contributions. Using this input, the Program Committee defined 12 workshop themes by clustering the submitted abstract topics. These workshops were developed in two series (A and B), and each series had six parallel workshops. The conference topics were the following:

Series A

A1. Conducting travel surveys using portable devices: part 1 – technological challenges

A2. Improving methods to collect data on dynamic behaviour and processes

A3. Stated preference surveys and experimental design

A4. Respondent/survey interaction in a world of Web and Smartphone apps

A5. Comparing and combining survey modes and data

A6. Caring for the environment

Series B

B1. Conducting travel surveys using portable devices: part 2 - role of technology in travel surveys

B2. System based passive data streams systems: smart cards, phone data, GPS

B3. Measuring attitudes, qualitative methods

B4. Sampling issues, data quality and data protection

B5. Built environment and contextual variables

B6. Surveys of hard to reach or specific groups/modes

Each workshop had two Co-Chairs, who were selected for their expertise and experience with the topic, to facilitate the discussion, and synthesize the conclusions. Participants were assigned to one workshop in series A and one in series B, according to their preferences, while trying to keep numbers roughly similar. The Co-Chairs were requested to make a brief introduction to the subject and present a general view of the state of the art, which was complemented with a set of 3-4 papers that collectively performed the role of a workshop resource paper. These papers were identified through the submitted abstracts and were selected for presentation in the workshop because they were deemed to illustrate the state of the art. Other related abstracts were identified as poster presentations to further illustrate the state of the practice on the workshop topic. The Workshop Papers were usually presented in the first session of the workshop, and the posters were presented in a two 2-hour poster session associated with the workshop series. The remaining workshop sessions were devoted to discussion, with the aim of obtaining conclusions and recommendations that were then presented to all conference participants in a plenary session. In addition to the Workshop activities, the Conference had three plenary sessions. In the opening plenary, four keynote speakers were invited to present different perspectives on the challenges and opportunities involved in advancing contemporary travel survey methods. These were: the policy maker's perspective; the researcher's perspective; and the transport modeler's perspective. The second plenary was devoted to emerging and neglected topics, where researchers were invited to discuss emerging topics, and those where we believe we could have done better in the past. The closing plenary included a round table session, designed to draw key insights and conclusions from the conference.

As in earlier publications, besides this introductory chapter, this Procedia contains keynote (plenary) papers, a synthesis of the discussions in each workshop, and selected workshop papers and poster presentation papers. These documents have been submitted by the authors and have been subjected to a peer review process.

3. Main outcomes of the conference

These Procedia provides a synthesis of the discussions held during the conference, both within the 12 workshops listed above and during the plenary sessions. Reports were prepared by co-chairs of the workshops, which summarise the workshop process with an emphasis on the identification of current state of research as well as research gaps.

This section summarises the main outcomes of the plenaries and workshops. More details are provided in the papers (associated to plenaries, workshop papers and posters),and workshop reports included in this Procedia.

3.1. Opening plenary

The conference started with a plenary aiming to set the stage and provide food for thoughts on the evolution of transport survey methods. In this opening plenary, four different perspectives were presented.

First, Tim Raimond, representing the New South Wales state government, emphasised the fact that our work, as a research community, should contribute to develop a better society. He focused on the importance of continuous data and improving methods to process and weight them. He suggested that our research community should make better use of real-time information. Finally, he suggested that research should become more useful to decision making by providing evidence of the actual influences of choices. To improve use of models in the decision making process, better transparency is required in the underlying assumptions and processes.

David Hensher (Hensher, 2014), on his talk on « *Big Gaps and Big Opportunities: More Behavioural and (relatively) less Statistical! A Focus of some themes in the Workshops*», emphasized the importance of 'selling' what we do to politicians, reiterating the point that research outcomes should play a larger role in decision making. He focused on selected themes (role of stated preference surveys, complexity in stated choice design, nudging in transportation, consumer panels), proposing that these should be taken into account during the workshop discussions. He also identified four key challenges: 1) Big Data and the necessity to focus on population level measures, that better fit behavioural analysis, instead of relying on average level values; 2) Developing choice experiments which are conditioned by previous responses of each individual; 3) Clarify the respective role of SP and RP to improve behavioural analysis and modelling and 4) Developing relevant data and serious study of behaviour to influence political buy-in.

Kay Axhausen presented « *A researcher's view* » on travel surveys. What exactly do we want to know from travel survey data? This is one of the questions he raised while demonstrating the various errors within the available data and the necessity to account for such errors. He also focused on the concept of respondent burden and showed how it affects response rates. One of the important messages from his talk was to make sure we fully understand the value, content and significance of the data we use.

Finally, Stephen Hess talked about « *Challenges for very large transport models: the example of Transtools3*». He presented the development of a comprehensive passenger and freight model for all of Europe and emphasized the fact that building such large-scale project is not trivial and that it ultimately depends on the availability of good data. Various issues were identified: creation of relevant zoning system, heterogeneity of indicators, definitions and estimation methods, and disconnected networks. In this example, complexity emerges from the scale of the project.

3.2. Café clinic – promoting express discussions with experts

As part of the conference, an activity called the "Café clinic" was included. Its aim was to facilitate interaction between experts of a specific domain and the conference participants. Martin Trépanier moderated the activity where participants were invited to reserve a spot on a table for a short period in order to discuss specific topics related to the transport survey domain. Experts were identified on a range of contemporary topics including: Statistical elements related to sampling, bias and weighting (expert: Jimmy Armoogum); Survey design and implementation (expert: Peter Stopher); High Dimensional Heterogeneous Choice Data (expert: Chandra Bhat); Qualitative Surveys (expert: Karen Lucas); Smartphones (expert: Stephen Greaves) and Overall survey design and Qualitative methods (expert: Peter Jones).

3.3. Plenary on Emerging and Neglected Topics in Survey Methods

A second plenary aimed at giving some space to topics that are receiving (arguably) too little interest from the community as well as emerging topics was conducted on the second day of the conference.

A talk by Werner Brog was planned but could not be held. Still, the content was consolidated into a paper (Brög, 2014) « Surveys on daily mobility are not surveys to go". In his paper, Brog recalls the basic requirements for valid mobility surveys and insists on two important aspects of surveys methods which can have a great influence on the quality of the outcome sample and data, namely: 1) the survey management process and 2) lower sample rates and smaller samples.

Oliver Roider presented an « *Innovative integration methodology of independent data sources to improve the quality of freight transport surveys* » (Roider et al., 2014). Freight is one of the topics that (unfortunately) did not receive the required attention at the conference. This presentation illustrated a quite practical data integration exercise conducted to improve the quality of road freight transport statistics. Challenges related to the multiplicity of stakeholders, data fusion of heterogeneous sources (zoning system, time period, ownership, unit, definition) were discussed.

Simon Washington presented « *What Mobility Options will Consumers Purchase in 2030?--Addressing Challenges of Long Range Forecasting* ». His talk aimed at promoting discussions on long-range forecasting issues, sometimes required to assess strategic questions such as determining likely market scenarios for energy efficient vehicles and how we can forecast future demand for such vehicles. He presented the concept of scenario planning and how it can be applied to develop plausible scenarios for 2030. He proposed a «Bayesian Truth Serum» approach that helps reduce bias towards the « likely mean » values by accounting for the empirical distribution of expected answers. He suggested exploring if such an approach could be relevant in validity checks for SP surveys.

Peter Stopher invited the community *to think outside the box* with respect to survey methods! He raised a variety of issues: representativeness of samples, too many surveys conducted with bad tools, literacy, conflicting data needs vs willingness to respond, privacy issues related to the use of technology as well as the consistency of technology use by respondents, the need for processing standards and good measures of accuracy or completeness, the fact that we may need different data sources depending on our needs (data to describe the present vs data to forecast the future). He suggested that with the decreasing representativeness of typical samples, it may be time to focus on particular markets and more deeply understand their behaviour.

3.4. Round table: contemporary survey issues and an identification of research needs

The closing plenary was set as a round table aiming to discuss about contemporary survey issues. Kelly Clifton, Peter Stopher, Peter Jones and John Rose were panellists while Martin-Lee Gosselin moderated the discussion. Questions were asked by the audience on various topics that emerged from workshops and previous plenaries. Among them, the necessity for research to help documenting societal decisions was again raised. Also, the question of what data and precision is really needed for various applications (cost-benefit analysis, planning of service, slow modes) was discussed. The panellists were also enquired to discuss about how the transport survey conference had changed over the years. The issue of getting under-represented groups to participate in surveys was also addressed.

3.5. Workshop Series A

A1 – Conducting travel surveys using portable devices: part 1 – technological challenges

This workshop focused on the technological challenges related to the gathering and processing of data from portable devices. It was chaired by Chandra Bhat. First, it is clear that technology has changed our work. Hence, it is even clearer today that no one data source is perfect and that we still need to find ways to collect the ground truth, in order to assess the quality of the available datasets. Representativeness is still a key issue: with technology-driven surveys, quality and comprehensiveness of sampling frame remains a critical issue, namely with the possible self-selection issues. Development of applications needs to account for the heterogeneity of respondents. As research issues, the participants noted the improvement of data processing methods, a better assessment of how to deal with messy and missing data as well as the need for more demonstration of successful data fusion. Stopher et al. (2014)

presented a case where life logging cameras were used to record personal travel, together with GPS, providing a new source of ground truth. Zhao et al. (2014) presented an algorithm for stop detection in smartphone based travel surveys. The synthesis of this workshop is presented in Bhat (2016)

A2 - Improving methods to collect data on dynamic behaviour and processes

Within the context of advanced methods in modelling and planning increasingly requiring longitudinal data, this workshop focused on capturing the dynamics of travel behaviour and underlying decisions. For decades, improving panel, pseudo-panel and repeated cross-sectional designs have been central to the classical methodological discourse, as have the implications of observing multiple days or weeks for a given respondent. However, the toolkit of methods is expanding: in particular, recent developments make it possible to extend the period of observation, where useful, to months and even years. This workshop addressed the challenges and opportunities of evolving strategies to capture dynamics of travel behaviour over different time horizons, including reducing data limitations from classical designs, and issues, such as burden, related to data quality. The research perspectives considered were the use of longitudinal methods; use of living lab and real world experimentation; use of commercial or other types of panels and the biases they may have; treatment of panel participants; measuring respondent's perception of behavioural and contextual change, observing changes, processes of change and reasons of change; timing and duration of change in travel behaviour. Chlond et al. (2014) describe the design changes (sampling frame, web-based forms, sample size) brought to the German Mobility Panel in answer to declining participation rates, availability of new survey methods and new data needs. Aultman-Hall et al. (2014) describe a one-year web-based survey of overnight travel. They analyse the efficiency of various recruitment methods (direct emails, friends and family, transportation agencies, e-newsletter, facebook) and examine retention rates for the various associated samples. The authors highlight five main conclusions regarding the design of long-distance travel surveys. Their project suggests that monthly online surveys could help continuously gather data on overnight travel. Farabi and Hang (2014) analysed the quality of address information from three different US surveys. They found that the level of quality depends mainly on three factors: 1) data collection method, 2) the mode of transportation and 3) type of address (O or D) being reported. The workshop report (Lee-Gosselin and Gerike, 2016) summarizes the discussion, presents the definition of the technical terms adopted in the workshop, and describes the current state of research, open questions, challenges and opportunities for selected research topics that were chosen by the workshop participants for in-depth discussion.

A3 – Stated preference surveys and experimental design

This workshop addressed the challenges related to the design and implementation of stated preference surveys as a way to collect information on the preferences of individuals and groups. It was co-chaired by Elisabetta Cherchi and Kay Axhausen. Fruitful discussions were held during the workshop sessions and participants namely identified elements to improve current practices. The trade-off between realism in survey design and complexity needs to be further assessed, as simple designs may generate errors. Improving realism in survey is pointed out as one important research perspective as well as exploring the contribution of new technologies and of practices from other disciplines. Revisiting the available data, in the view of improved modelling techniques, is also identified as a key research perspective. The workshop synthesis (Cherchi and Hensher, 2016) presents the state of the art, and a discussion of some of the topics, including task complexity and respondents engagement; the effect of unfeasible or dominated alternatives; use of pictures; qualitative work; interaction within groups and adaptive/dynamic SP; experimental design. Finally, the key message from the workshop is that simpler models with good data are better than complex models with bad data.

A4 – Respondent/survey interaction in a world of web and smartphone apps

This workshop focused on various issues related to the design of web-based and smart-phone based survey tools. It was chaired by Joao de Abreu e Silva and Mark Davis. A diversity of elements were discussed during the sessions and various research directions were identified namely: developing measurements of burden and assess how it impacts response rates and quality of data, reducing interaction with respondent through passive data collection and improved automatic validation procedures, increased respondent enjoyment while participating in surveys, better measures of sample representativeness and developing mitigation measures to reduce possible bias, tackling the

privacy issue while increasing potential uses of data (especially data fusion), moving towards more flexible and custom interfaces (changing set of questions, feedback, follow-up questions). Hoogendoorn-Lanser et al. (2014) present a new household mobility panel for Netherlands that proposed an innovative design of a travel diary, benefiting from the state-of-the-art knowledge and making optimal use of technological capabilities. Schröder et al. (2014) describe the design of a household travel survey focusing on the gathering of intermodal trips. Dias et al. (2014) present the design process of the survey tool used for the FMS (Future mobility survey) project. They focus on choices made regarding graphical design and user interaction. Greaves et al. (2014) detail the development and deployment of an online travel/activity diary and companion smartphone app, designed to support a major study of travel in inner-city Sydney, Australia. The workshop report (Abreu e Silva and Davis, 2016) presents the state of the art and identified challenges; it also presents a discussion on how to perform surveys with the minimum possible burden.

A5 – Comparing and combining survey modes and data – Patrick Bonnel (MM)

This workshop focused on the comparison and combination of various surveys modes, and the challenges related to the use of data from multiple sources, their respective richness and limitations. Patrick Bonnel and Brett Smith chaired it. Some of the elements that were discussed in this workshop were: the effects of survey media (web, cell phone, face to face, mail) on sampling, non-response bias and measurement error. The participants also identified research needs, including the development of computer assisted software; respondent motivation – respondent engagement; and the need to combine methodologies. Bayart and Bonnel (2014) present the results of a web-based survey conducted in Lyon (France) as a way to reduce non-response rate. They compare the results of the phone and web-surveys and estimate a selection bias. They confirm that the data collection mode has a direct impact on mobility. The workshop report (Bonnel et al., 2016) synthesizes the discussions and research needs identified.

A6 – Caring for the environment

This workshop discussed different approaches (survey designs, analytical and modelling approaches) for dealing with environmental concerns and preferences related to transport and travel decisions. This workshop was co-chaired by Ricardo Daziano and Akli Berri. The discussions focused on six emerging issues: 1) measuring the energetic and environmental footprint of transportation activities, 2) benefits of new technologies in data collection process, 3) how to translate environmental information so that people can better understand, 4) better understanding of the reaction of people with respect to technological changes, 5) measuring the influence of perceptions and attitudes on travel choices and 6) how understanding of people towards the environmental impacts of transport systems influences behaviour. Meloni and Teulada (2014) present the architecture of a technology platform called IPET, a Persuasive Eco-Travel Technology, constructed for the purpose of automating phases and activities of a Voluntary Travel Behaviour Change program aiming to promote sustainable alternatives of transport. Using a stated preference experiment aiming to assess the role of information on pollution and individual stress, Sottile et al. (2014) confirm both aspects are correlated with behaviour and that aspects associated with stress have a greater influence on travel choices than pollution. Maruyam et al. (2014) investigate methods to increase the number of respondents in smartphone surveys, namely the respective contributions of recruitment methods and incentives. The workshop report (Berri and Daziano, 2016) presents the main outcome of the discussions.

3.6. Workshop Series B

B1 – Conducting travel surveys using portable devices: part 2 - role of technology in travel surveys

This workshop was dedicated to discussing the role of technology in the conduct of travel surveys. Specifically, the contributions of GPS, smartphones and life-logging cameras in the gathering of location and time data to either validate self-reported information and/or reduce respondent burden by automatically providing subsets of relevant travel data were addressed. The discussion focused on survey design, respondent experience, and post-processing of the data. Also, there was some discussion about how to share experiences from different groups/countries. Geurs et al. (2014) present a smartphone app called MoveSmarter that automatically detects times (departures / arrivals), trip ends (origin and destination), transport mode and trip purpose. This app appears to be promising; some improvements need to be made to trip and mode detection as well as battery consumption. Berger and Platzer (2014)

also present a smartphone app, this one called SmartMo and discuss the results of a field evaluation from three main perspectives: 1) technical performance, 2) usability and 3) user acceptance. The workshop report (Mohammadian and Bricka, 2016) presents more details about the discussions and outcomes from the sessions.

B2 - System based passive data streams systems: smart cards, phone data, GPS

Workshop B2 was also related to technology; however in this case, the discussion focused on passive data streams, and their potential contribution for transportation analyses. Passive data streams are all streams of data that are gathered without any interaction with system users or travellers. The workshop discussed the challenges of processing these data and how they can contribute, along with other sources, to meet increasing data needs in transportation planning. Bonnel et al. (2014) experiment with the use of passive mobile phone data to derive origin-destination matrices. They compare the results with two reference matrices finding that comparison with the census matrix is disappointing but the comparison with travel surveys is promising. They identify ways to improve the data processing methods of mobile phone data. Using tweet data published at the time of the Great East Japan Earthquake, Hara (2014) model the return home decision of commuters. They extract behavioural data from the tweets and create explanatory factors from geo-tag and tweet data. The workshop report (Trepanier and Yamamoto, 2016) synthesizes the discussions that went through different types of passive data streams (GPS, mobile phone, Bluetooth, smartcard), and how to add sociodemographic information, to make it valuable for transport planning and modelling.

B3 - Measuring attitudes, qualitative methods

This workshop focused on two main aspects: the importance of measuring the underlying psychological motivations for people's travel choices and behaviour and the respective roles of qualitative and quantitative methods to improve model design and understanding of behaviour. The workshop was chaired by Juan-Antonio Carrasco and Karen Lucas. Various research needs were identified, for instance: socio-psychological theories and ways to include their outcomes into choice models or real demonstrations of how qualitative approaches can be used to explore questions that quantitative methods fail to assess. Finally the participants recommended finding ways to encourage more debate and knowledge sharing between quantitative and qualitative transport researchers so as to make sure real mixed-methods approaches can be developed. Susilo et al. (2014) presented the results of a pilot survey conducted as part of a European project, METPEX, aiming to develop a tool for the assessment of the whole journey experience, from pre-trip information acquisition to arrival at the final destination. This survey tested the inclusion of questions related to five variables expected to influence the traveler's experience: individual attributes, contextual variables, attitudes, travel experience and satisfaction. From the pilot as well as stakeholders' feedback, they identified the most relevant questions to include in a large-scale survey. Järvi et al. (2014) present a process that was implemented to define possible long-term scenarios and assess their potential impact on CO_2 emissions in Finland. This process involves the development of a pluralistic back-casting method. The workshop report (Carrasco and Lucas, 2016) further details the main elements from the discussions.

B4 – Sampling issues, data quality and data protection

This workshop discussed the various elements that can have an influence on transport survey data quality. Issues such as respondent bias, non-response, sampling issues, and declaration bias were discussed along with archiving and confidentiality concerns. It was chaired by Jimmy Armoogum and Jennifer Dill. Wittwer and Hubrich (2014) recruited more than 4,800 non-respondents of the « Mobility in Cities – SrV 2013" to participate in an abbreviated questionnaire. This process was implemented to evaluate the reliability and validity of the 2013 survey results. Using various statistical approaches, they demonstrate that participation in the main survey can easily be explained by sociodemographic parameters, while differences in travel behaviors among respondents and non-respondents turn out to be smaller. Gonder et al. (2014) describe the development of a TSDC (Transportation Secture Data Center) to provide access to data while preserving privacy. This center includes both data access features for approved users as well as a publicly accessible website for downloading cleansed data. The participants of the workshop agreed on a research agenda structured around three elements: 1) better understanding of why (or why not) people participate in surveys and what attributes explain differences in response rates, 2) better assessment of the various types of bias

and their sources, 3) innovative ways to use and combine available data. The workshop report emphasises these elements (Armoogum and Dill, 2016).

B5 - Built environment and contextual variables

This workshop was devoted to the discussion of how to capture the effect of built environment in transport related choices (mode, route, location). Given the increasing availability of spatial data, and the importance of built environment and contextual variables in transport decisions, this is a growing field. However, there are many challenges and unresolved questions. The workshop discussion began with an effort to set the context; then some part of it was dedicated to measures of contextual environment using archived spatial data; and the rest to mixed methods and innovative approaches. Hurtubia et al. (2014) propose a method to quantify the relevant of qualitative attributes describing public spaces (beauty, safety, security). From the case studies they have conducted, they conclude that the use of images to describe such features introduces a bias in the perception of importance and scale of these attributes; further exploration is needed. Bonet et al. (2014) propose a framework to better understand heritage neighbourhood valuation by its inhabitants. The main features of such areas were identified though a Delphi survey; the two most important are 1) Community and social networks and 2) Building morphology. They develop an instrument to capture the preferences of inhabitants of heritage areas and assess their contributions using discrete choice models. The workshop report (Clifton and Perez, 2016) synthesizes these discussions, and finalizes with a reflection about the need of a comprehensive, unified theory to guide the study design and data collection efforts.

B6 - Surveys of hard to reach or specific groups/modes

Finally, workshop B6 focused on the methodological and analytical challenges related to reaching and conducting surveys among specific groups or on specific trips that are not adequately captured if traditional techniques are used. The workshop focused on identifying hard-to-reach groups (e.g. tourists, foreigners, homeless, unemployed, too busy, not mobile, elderly, children, disabled). For each of those groups, the workshop participants discussed the specificity of the different challenges: enumerating them, defining a sample frame, accessing them, communicating with them, and engaging them into the survey experiment. They also discussed how these groups change over time, and how to address traditional questions such as sample size, survey quality, unity of analysis, for these untraditional groups. Stark et al. (2014) report on a before-after experiment among young people involving two survey phases: information and activity. They point to a set of lessons learnt from their experimentations namely the importance of involving the target group in the design of the questionnaire, limiting the conditional questions and the use of abbreviations and assuring that the survey can be integrated in the school curriculum so it can be filled with supervision. Park and Hahn (2014) present a procedure for the estimation of regional freight demand using data from commodity flow surveys from Korea. The authors conclude that while such data are relevant for regional analysis, truck-based methods may provide better results if the focus is on vehicle analysis or trip assignment. Porter et al. (2014) present the methodology deployed to investigate older people's physical access to health and other services in rural Tanzania. They propose a co-investigative approach where people from the community are trained and employed to conduct surveys. They conclude that such an approach is one of a number of qualitative approaches with great potential for wider application to reach diversified population segments. The workshop report (Ampt and Hichman, 2016) provides insight into the critical groups and associated challenges.

4. Synthesis

The conference, the 10th of the series, was an opportunity to report on the state of the art on transport survey methods but also to question the way transport surveys are conducted. There are a few striking elements that transcended the various discussions.

4.1. Main challenges

First, technology has changed and is continuously changing the way we conduct and process surveys. However, there needs to be a better assessment of which technology is best suited for which survey and which technology is best suited for each respondent. Moving towards customised surveys for each respondent is something that we can

foresee through recent developments, both because of the ever-increasing opportunities offered by technology and as a way to better account for the particular behaviour of individuals, their learning process and their mixture of preferences, attitudes, and experiences. In this context, there is a need to better understand the impact of the various survey methods on data quality, content and significance. We need more insights into how survey methods change the type and quality of data we gather as well as the role of each survey component (interviewer interaction, interface design, burden level, recruitment strategy, incentives) in the observed differences.

Also, there seems to be an increasing focus on data, making sure their development process, meaning, quality and representativeness are better understood and documented, as well as what contribution each set can make in the analysis and modelling framework. It seems we are moving away from the « one size fits all » data source to a more complex mixture of small/large, qualitative/quantitative, survey/passive stream of data to provide the required sets for each need. This comes with the need to develop data fusion strategies, more efficient data validation processes and mixed-method approaches. Actually, there is a plethora of methods and techniques to deal with typical survey data but our focus needs to be much more intense on the way we can automatically validate, process, analyse and visualize passive data streams and longitudinal datasets to provide real tools and methods instead of demonstrations with subsets of data. At the same time, we need to make sure that our surveys keep pace: they still play a central role in our data acquisition framework but are being challenged by issues such as low response rate, recruitment, declining representativeness of sampling frames and final samples, self-selection, tradeoff between comparability and being obsolete with respect to emerging issues.

To provide better tools for decision making, the community also needs to be more focused on understanding behaviours by moving towards a real integration between quantitative assessment and qualitative insights. Modelling choice is important but we need to observe changes, the processes of change and the reasons why changes occur. It is hence important to understand why and how the decisions are taken as well as the factors that drive these behavioural decisions. Attitudes and respondent enjoyment during surveys are examples of components we need to look into; assessing ways to measure them and include them in the survey and modelling design. We probably need to reach out to researchers in other domains (sociologists or psychologist for instance) to help us really move forward with these elements.

4.2. Some questions arising from the conference

In light of the various discussions held at the conference, we have identified a set of questions that summarise the main challenges that the research community is currently facing and clarifies where we should be focusing our energies for the next conference.

1) Are we (can we) really benefiting from big data?

Several research efforts are currently being conducted to demonstrate the value of passive streams of data and large sets of data. However, they are still at the case study level and are a long way from supporting automated processes implemented in transportation authorities to support day to day operations and strategic planning. We need to do more than just testing and prototyping methods and models with small samples of data. To do this additional step, the community requires more specialists in data management, archiving, computer sciences, and other data science domains. Research needs to be conducted into data fusion and provide applied examples for the transport domain using combinations of survey and passive data.

2) What data do we need and what do we want to do with it?

We realise today that we probably need different datasets to support various needs. In the past, we were lucky when we got access to some data to develop our analysis and models and were using them even if they were not the most appropriate ones. Our main data source has changed and is being challenged. Describing the present and forecasting the future using sets of scenarios probably should not rely on the same sources of data. There needs to be some digging into what other sources of data can be useful for our needs; we also need to assess the values of other sources of samples for our surveys, such as consumer panels or social networks.

3) We need to take better care of our respondents!

If we want surveys to remain central to our data acquisition framework, we need to take better care of our respondents. Efforts should be put into clarifying the concept of burden, defining it, measuring it using standardised formalisation to allow for comparison and understanding its incidence on sample size and representativeness as well as on data quality and completeness. We need to improve the survey experience for respondents, using various media, customisation and features from fun theory. Research is needed to understand how providing respondents feedback on their behaviour can improve their survey experience. We need to develop stronger arguments and benefits for participating in our surveys.

4) How to develop a continuous « Business case » for data collection processes

Getting access to data for modelling and strategic planning is an ongoing challenge. The value of data needs to be continuously demonstrated and new approaches should also be experimented with so replacement processes are ready when the time is right and evolution can occur more smoothly. The community needs to make sure that every survey being conducted is an opportunity to test/assess the value of an innovation so we can correctly assess the challenges related to comparability and foresee when new methods are mature and it is time to change.

5) What about sample size?

We need more focus into the statistical components of survey methods. Rigorous assessments of issues such as optimal sample size (quantity vs quality in the presence of limited resources), data comparability (easier to think that not changing the method will provide comparability that developing adaptation factors) or non-reaching / non response of some population segments is necessary.

6) How to improve pooling of experiences among international researches?

The research community needs to become more efficient as a whole. There needs to be a more efficient use of survey experiences conducted throughout the world with emphasis on their spatial transferability and generalisation. At the same time, revisiting existing data should not be put aside as it could provide insights into emerging issues. Sharing of findings should be emphasised; both successful and failed experiences are relevant for publications. In this sense, we should draw a framework for data and idea sharing regarding survey methods and make it open source to speed up our research outcomes.

7) How to make politicians understand the importance and relevance of what we do? How to be relevant for decision making?

While we are quite efficient in providing contributions to the scientific community, we lack sensitivity towards how the improved knowledge or models we develop can support decision making. We should contribute to make our world a better place by providing better tools and methods to the decision makers. Our contributions need to translate into data that can describe and clarify societal issues but also influence population support of critical projects.

8) What should we focus on for 2017? What research do we need?

Finally, this conference feeds from a very dynamic research community; discussions through the workshops have helped identify a variety of research challenges and issues. We need to make sure all this knowledge is capitalized into a shared understanding and that we put our energy into moving our research community forward.

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